OCCURRENCE OF LAJTA LIMESTONE IN WESTERN MÁTRA

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INTRODUCTION

The area of Tar in the western part of the Mátra Mountain is fairly separated from the massif of Mátra, namely the trend of Ágasvár—Óvár turns to SW direction and is continued across the Nyikom. At the area of Tar separated by faults, the same volcanic formation can be found as in the Mátra horst. Its peculiarity is that within small fields in patches as surface formation tuffaceous limestone with fossils appear, thus the time of the volcanic activity may be precisely established, ending in this area in the Upper Tortonian.

Reports concerning such formations has been made by Noszky [7, 8] and on the basis of these reports in his monography about the Mátra [9]. In his opinion the tuffaceous formation at the end of the trend between the brook Csertő and Madarász in the Csevice Valley can be considered as Lajta limestone. Noszky is, however, of the opinion that it can not be decided whether these formations are interbeddings in the volcanic horizon or small superimposed parts. Schréter [11] while examining the surface formations of the coal basin of Nagybátony mentioned these formations already stated by Noszky, however, he could not find them, nor are they represented in his map.

Cs. Meznerics [3], too, ranges this formations among the tuffaceous limestones of the Tortonian limestone group, however, referring merely to earlier literary data, registering the literature concerning the Lajta limestone. Kubovics [5] considers the biotite-amphibole rhyolite tuff with heterostegina in the valley of Madarász and Szalajka brooks as the first marine sedimentation following the Tortonian andesite volcanism.

Several authors have been dealt with the stratigraphy of the neighbouring Cserhát Mountains. Its comprehensive literature up to 1940 is given by Noszky [10]. Recently Bogsch [1, 2] hase elaborated the stratigraphy of two almost classical occurrences.

The technical geological investigation of the rocks of the limestone quarry at Mátraszöllős was carried out by Kertész [4].

While geological mapping of the Mátra in 1962, the author could noted the occurrences mentioned by Noszky as well as new ones [6].

The continuous surface occurrence of the calcareous — tuffaceous formation is found in the eastern stretch of Csevice Valley of Tar in the middle section of the Szalajka Valley from the confluence with the Madarász brook towards east from 300 to 520 meters. It appears in its best development at the eastern end of the occurrence *(Figs. 1, 2).*

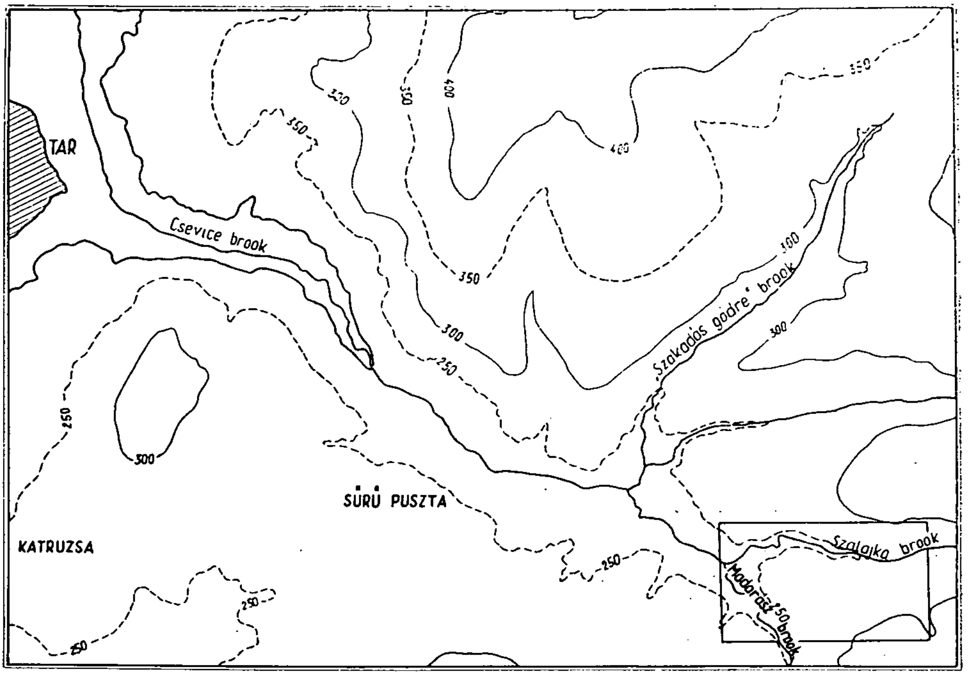


Fig. 1.
Geological sketching map of the occurrences

Although this occurrence renders impossible to trace the surface correlations, due to the detrital slope, however, as to the development it is in agreement with the small outcrop on the ridge of the hill south of Szalajka brook, where the calcareous-tuffaceous, fossiliferous formation can, if not always in stand-up formation but in fragments, be found.

The colour of the rock is commonly whitish-gray, in places with brownish-gray spots, with manganese dendrites on the parting planes. Fairly porous, easily crumbling, more compact variety, found at certain levels, is as a rule, generally more arenaceous. In this occurrence, levels, if not well discernible, can be noted.

In the occurrence at the brook Szalajka a fine-grained andesite-lapilli level cemented with calcareous mud is situated as the lowest. This level is situated on the surface in the stream of the brook of the lower section of the Szalajka. This type is immediately settled on the andesite tuff showing a lamellated development and opened up at the confluence of the brooks Szalajka and Madarász. This cemented part is likely a re-aggregated formation, since partly small limestone pieces can be found in finer-grained andesite tuff *(Fig. 3.)*, partly

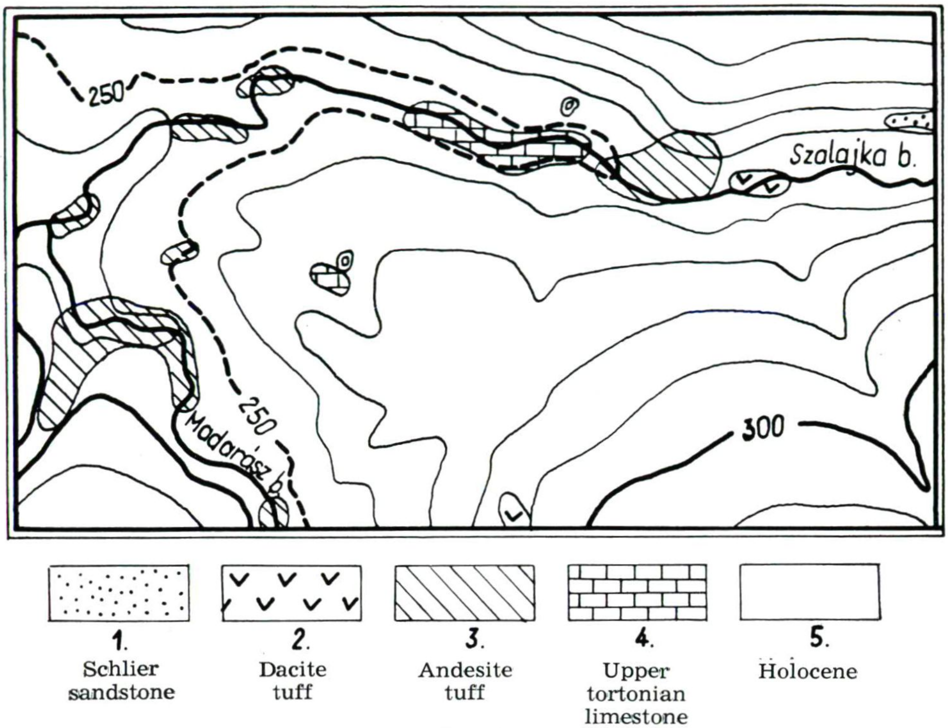


Fig. 2.
Surface formations of the area investigated

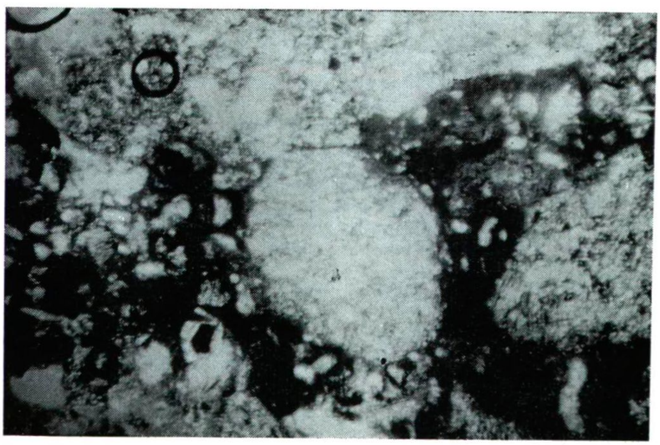


Fig. 3. Limestone pieces in andesite tuffaceous cementing material. Crossed nicols, ×30.

andesite lapilli are cemented with fine-grained calcareous material *(Fig. 4.)*. The lapilli reach 1—2 cm in size. The tuff-detritus being somewhat rounded may be of the same size. The rock cemented with calcareous mud is fairly compact. Its mineral fragments are plagioclase feldspars with twinning-lamellae and with zonal structure and a few, rather splintered quartz.

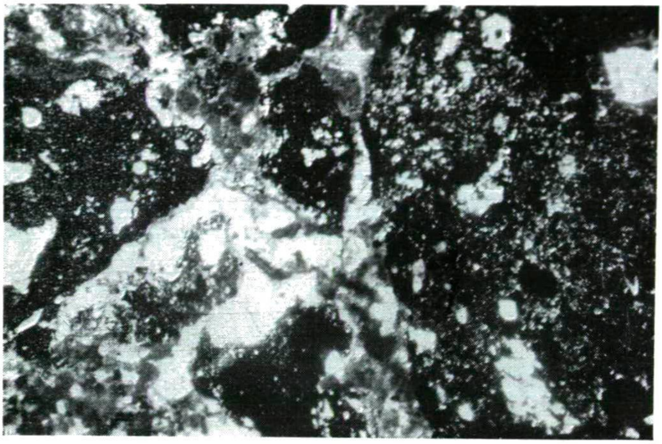


Fig. 4.
Andesite lapilli in calcareous cementing material. Crossed nicols, ×30.

Fig. 5.
Remnant of protozoa of siliceous skeleton in limestone. Crossed nicols, ×30.

A part of the lapilli is pumice, wherein the biotite and plagioclase are well discernible. Among the threads of the pumice the deposition of the calcite is very frequent and many times, alone the texture refers to its being pumice, as the pumiceous parts are completely impregnated with calcite. The other part of the lapilli consists of andesite, wherein zonal plagioclase feldspars and in places hypersthene occur. The andesite lapilli have mostly vitreous matrix. Among the lapilli sometimes rounded detritus of the tuffaceous cementing material is also recognisable. These lapilli and detrital parts are embedded in fine-grained calcareous cementing material in which sometimes remnants of siliceous skeletons of protozoans *(Fig. 5.)*, partly foraminifera-skeletons are found.

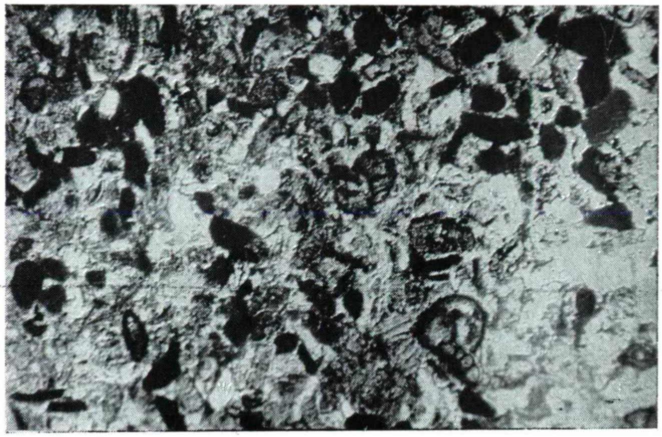
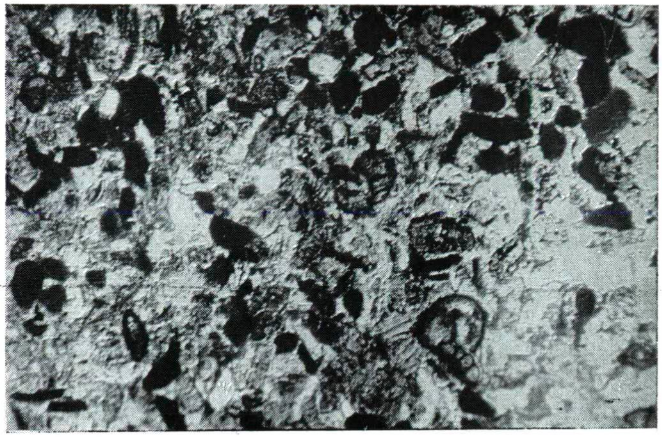


Fig. 6.
Limestone with recrystallized foraminifera. Crossed nicols, ×30.

Fig. 7.
Cavity-filling with coarser-grained calcite. Crossed nicols, ×30.

This lapilli-containing level is followed by a more compact, middle-grained and harder level. It is white or light gray coloured, at times manganese oxide separation in black spots can be noted. The rock contains fairly numerous foraminifera. They had been mostly completely recrystallized, in most of the cases merely patches designate their site *(Fig. 6.)*. The rock contains fragments places hypersthene occur. The andesite lapilli have mostly vitreous matrix. Among the lapilli sometimes rounded detritus of the tuffaceous cementing material is also recognisable. These lapilli and detrital parts are embedded in fine-grained calcareous cementing material in which sometimes remnants of siliceous skeletons of protozoans *(Fig. 5.)*, partly foraminifera-skeletons are found.



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These layers contain macrofauna only then and there and in western direction they are pinched up. Where this layer is the thickest, according to our present observations, it reaches at best 2 meters.

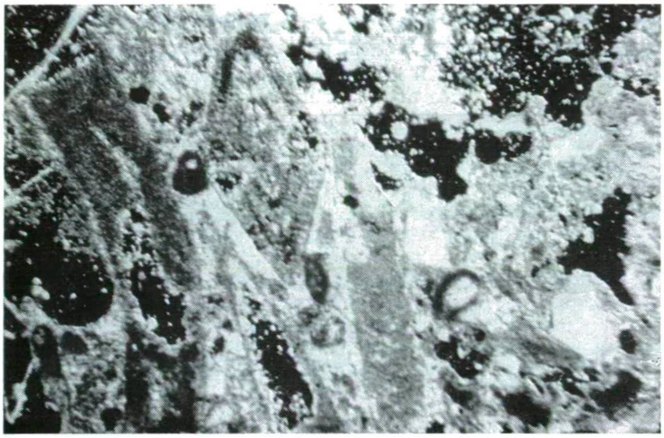

Fig. 8.
Recrystallized fossils in limestone. Crossed nicols, ×30.

Fig. 9.
Recrystallized fossils in limestone. Crossed nicols, ×30.

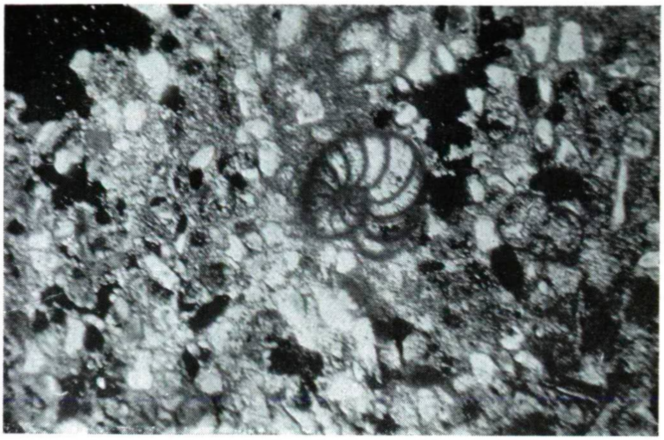

Fig. 10.
Foraminifera in limestone. Crossed nicols, ×30.

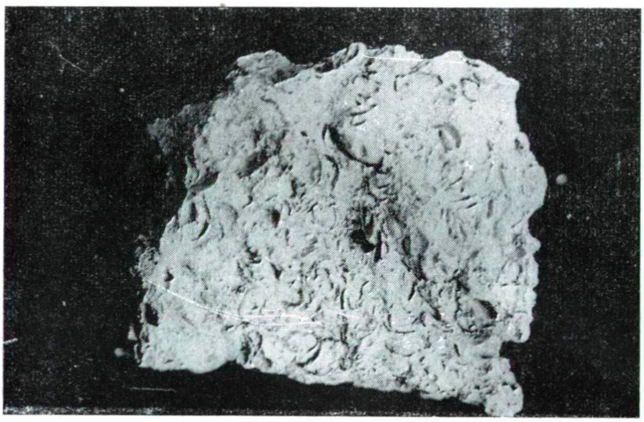

Fig. 11.
Lumachelle-like limestone. Natural size.

More interesting is the level of 2—3 meters in thickness superincumbent on the level mentioned above, opened up in the eastern end of the occurrence. This layer is characterized by the abundance in fossils, although these are either mostly molds poorly conserved or the shells are fully recrystallized, the site of the fossils are merely indicated by patches *(Figs. 8—10.)*. It can be established also by naked eyes, these shell-fragments are reminders of lumachelle though lacking the pearly luster *(Fig. 11.)*.

The calcium-bearing solutions could play a role during the diagenesis and partly also subsequently as around the fossils, especially around the molds of the gasteropods, on the print of the shells, a crust of calcite crystals in a thickness of 1—2 mm and sometimes small spots of manganese oxide can also be found *(Figs. 12, 13.)*.

In this level is very frequent the dacite-tuff interbedding in form of thin pinching out layers or in form of pumiceous details. The latter shows very well

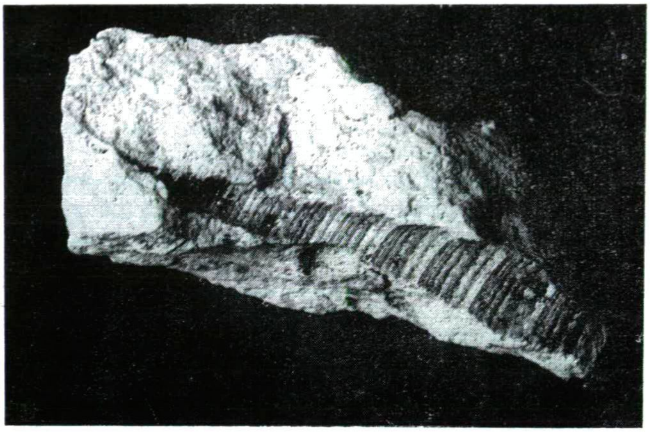

Fig. 12.
Print of a gasteropoda, filled with calcite. Natural size.

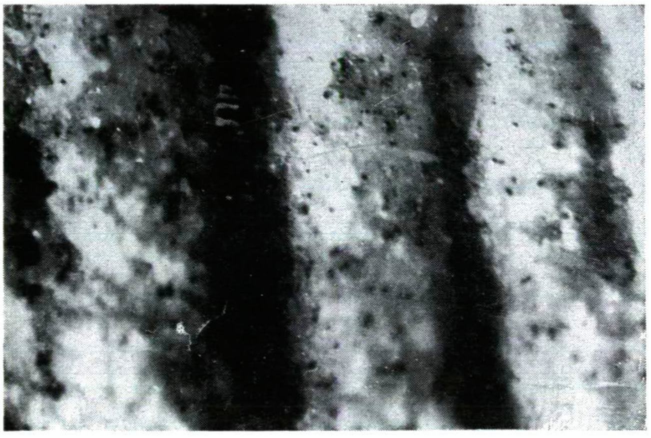

Fig. 13.
Calcite coating on gasteropoda-shell with spots of manganese oxide. ×25.

the fluidal texture and no formation of calcite can be established in it *(Fig. 14.)*. Beside the plagioclase feldspar with twinning-lamellae and quartz *(Fig. 15.)*, the biotite and amphibole are equally occurring. The feldspars of the tuffitic rock are unaltered, they show no formation of calcite.

In the samples collected from this layer the following macrofauna was determined by Miss M. HAVAS:

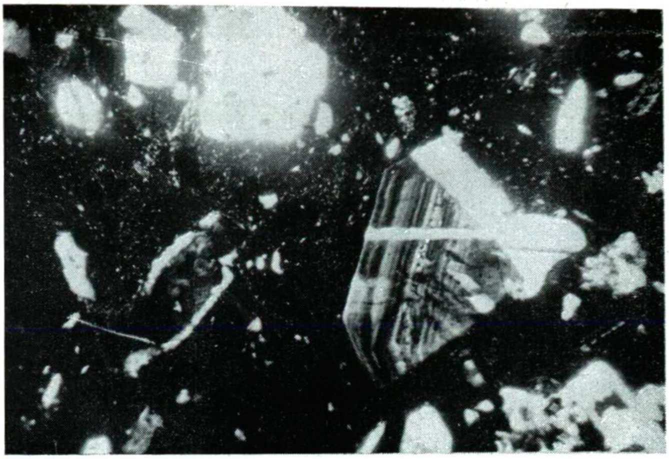

Fig. 14.
Feldspar with zonal structure and quartz in tuffaceous interbedding. Crossed nicols, ×30.

Gasteropoda:

Turritella (Haustator) badensis Sac.
Turritella (Archimediella) subarchimedis d'Orb.
Natica (Lunitia) catena helicium Brocc.
Turritella sp.
Polynices sp.
Mitra sp.

Bivalva:

Venus (Clausinella) basteroti Desh.
Ciprina girondica Ben.
Pecten aduncus Eichw.
Phacoides (Linga) columbella Lam.
Pitaria (Paradione) chione Lam.
Arca sp.
Lucina sp.
Mactra sp.
Meretrix sp.
Tapes sp.

The fossils are poorly conserved. The most numerous appearence of the *Turritella* species was to be observed, however, in thin layers minute, recrystallized shell-fragments fo some mollusca were also to be noted. These fragments refer to the same species and the layer containing these fragments was free of gasteropod remains.

At the occurrence of the middle section of the brook Szalajka the rock is loosened on the surface. Its formation was promoted by the dissolving action of rain-water. Sometimes calcareous tuff-like rock can be found with fossils of smaller or greater amounts. In places, along the fissures limonitic staining occurs in patches. In the cavities calcite crystal groups of scalenohedral habit are frequent.

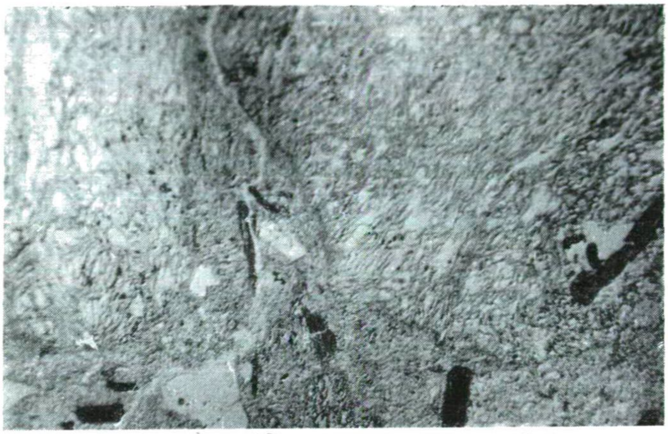

Fig. 15.
Pumiceous detail from tuffaceous interbedding. Plain light, ×30.

South-west of the occurrence in the Szalajka Valley, at the lower parts of the ridge, between the brooks Szalajka and Madarász, 15 meters higher over the sea level than the former occurrence, the tuffaceous limestone can likely be noted partly detrital partly in stand-up formation. The whitish- in places yellowish-gray rock is fairly compact. In this rock molds of mollusca are striking. Along fissures, cavities, the deposition of calcite is frequent. On the surface of the calcite crystals traces of dissolution can always be seen, well developed

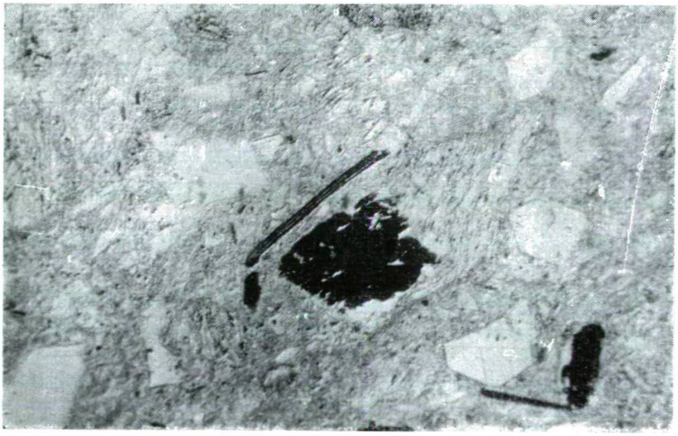

Fig. 16.
Amphibole and biotite in pumiceous-tuffaceous interbedding. Crossed nicols, ×30.

crystal-forms can but rarely be observed. The surface of the calcite is sometimes covered with a blackish-gray coating.

The dacite-tuff interbeddings are of the same character as at the occurrence in the Szalajka Valley. Pumiceous details can also be here found. The light rock-forming minerals are zonal plagioclase feldspars with twinning-lamellae and a few quartz. These mineral-fragments are mostly angular. Of the dark rock-forming minerals the biotite appears in greater amount than the common amphibole *(Fig. 16.)*

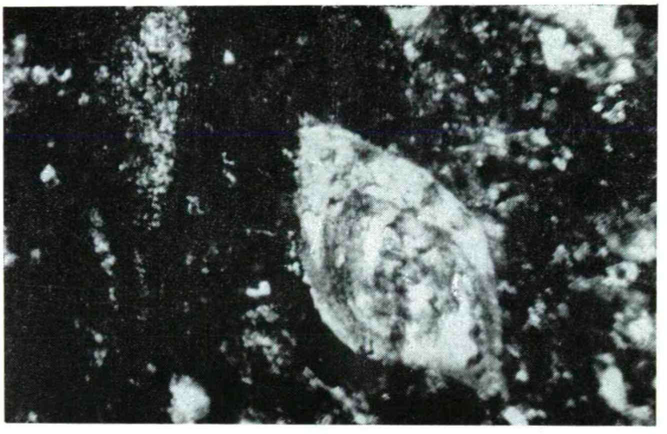

Fig. 17.
Foraminifera in limestone. Crossed nicols, ×30.

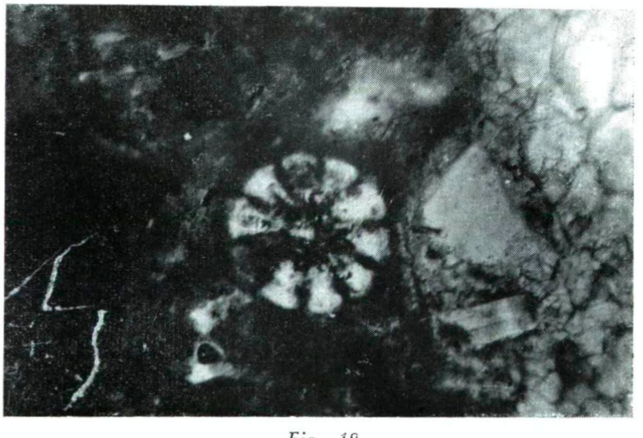

Fig. 18.
Remnant of a *Vincularia*. Crossed nicols, ×30.

The limestone is also here dominantly fine-grained, wherein foraminifera can be observed *(Fig. 17.)*. The remnant of some bryozoa found in the same layer proved to be remnant of a Vincularia according to the determination of Prof. G. Kolosváry *(Fig. 18.)*.

The smaller cavities in the limestone are fairly frequent, the walls of which is encrusted by calcite crystals seemingly of scalenohedral habit, though the crystals are fairly rounded due to dissolution.

This occurrence is settled also on andesite-tuff. It has still smaller surficial extension than that in the Szalajka Valley, namely, in the western direction andesite-tuff can be found, whereas in south-east dacite-tuff occurs along the line of break. It is the same formation as that in the Szalajka Valley and the part on the surface would correspond to the middle, fossilized, pumiceous part of the occurrence mentioned above.

Neither lamination nor banked structure was observable at both occurrences. The distinction of the single levels was rather possible on the basis of petrological and paleontological observations.

At the north side of the brook Szalajka this formation can not be found even in fragments. Probably the part faulted along the lines of break at the time of the formation of the valley could only remain on the lower parts, whereas from the ridge between the Csertő and Szalajka Valley it has been eroded.

The tuffitic character of the occurrence in the Szalajka Valley is slightly reflected by the chemical composition of the single levels. The lower level (Anal. 1.) consists of compact limestone with fairly abundant feldspar debris and quartz. The upper level (Anal. 2.), rich in fossils, is in places purer, containing fewer mineral debris. The results of the analyses carried out by Mrs. Dr. Eve K. Rózsa are as follow:

	1.	2.
SiO_2	42,46%	10,46%
Al_2O_3	3,27	2,25
Fe_2O_3	0,15	1,22
FeO	—	—
MnO	—	—
MgO	—	—
CaO	26,78	47,45
Na_2O	3,62	0,21
K_2O	1,99	traces
CO_2	21,00	37,30
H_2O^+	0,65	1,06
H_2O^-		
	99,92%	99,95%

As it can be seen also from the results of the analyses, the $CaCO_3$ content is fairly variable (47,8—84,8 per cent) depending upon the amounts of tuffaceous and arenaceous interbeddings, respectively. The change of the amount of the SiO_2 content may be explained by the more or less arenaceous development of the limestone. It is shown by the low Al_2O_3 content that in these samples, among the mineral fragments, the feldspars play no essential role. The presence of the iron content as ferri is natural, since a surface formation is in the question, further this formation contains no considerable amounts of dark rock-forming mineral fragments with ferro-iron. It is interesting that no part of the

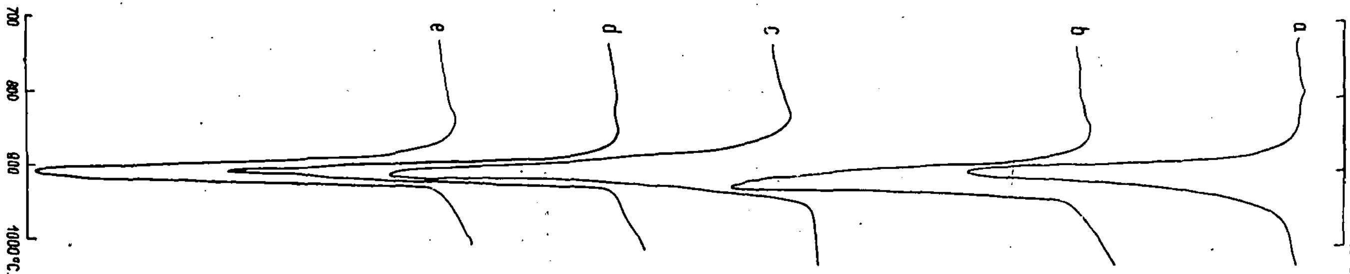

Fig. 19.

DTA curves of the single samples taken from different levels. *a)* lower level; *b)* and *c)* middle level; *d)* upper level in the stream of the brook Szalajka; *e)* tuffaceous Lajta limestone of the ridge south of the brook Szalajka.

exploration contains MgO, nor in traces. The mineral composition of this formation on the surface is the following: calcite 85 per cent, cca. 7 per cent quartz and the same amount of plagioclase feldspars.

It is stated that the magmatic rocks and their tuffs, present here, are very poor in minor elements. The same can be said about the limestone. According to the investigations it contains Cu and B merely in weak traces and the presence of Pb, Zn and Ba is questionable.

On the basis of the differential thermal analyses the dominating role of the $CaCO_3$ could be established in the samples taken from the single levels *(Fig. 19.)*. The endothermic peak was always assymetric. The maximal temperature of the endothermic peak reached at best 940°C. It is shown by the shape of the curves and that of the peak, respectively, that in the samples only $CaCO_3$ and no other carbonates occur. Peaks referring to the presence of clay minerals could not be observed, in agreement with the results of the mineralogical investigations.

The rock, taking into consideration the statement of Cs. MEZNERICS [3] too, is the tuffaceous formation of the Lajta limestone group and as such it denotes the most eastern part of the Upper Tortonian sea.

ACKNOWLEDGEMENT

The author expresses his gratitude to Prof. G. KOLOSVÁRY and Miss M. HAVAS for the determination of the fossils, to Mrs. EVE K. RÓZSA for the analyses and to Mrs. E. ÖRDÖG for the carrying out of the DTA examinations.

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